IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

APPENDIX A

1. A method for maximizing satellite constellation coverage at predetermined local peak times for a set of predetermined geographic locations, the method comprising:

determining a satellite constellation having a first coverage, the constellation including at least two desired satellites, wherein each of the desired satellites has a trajectory associated therewith and a relative orbit within the satellite configuration;

determining a period of orbit for each of the desired satellites;

determining a time dependent coverage of the satellite constellation based on the orbit period and the trajectory of each of the desired satellites;

determining a second coverage based on the time dependent coverage, which provides maximum coverage by the satellite constellation at the predetermined local peak times for the set of predetermined geographic locations;

determining a tilted trajectory for each of the desired satellites to reorient the satellite constellation without changing the relative orbit of the at least two desired satellites with respect to each other within the satellite constellation so as to obtain the second coverage; and

generating command signals for modifying the trajectory of each desired satellite based on the tilted trajectory.

2. The method as recited in claim 1 wherein generating the command signals includes programming a computer with orbital parameters based on the tilted trajectory.

3. The method as recited in claim 2 further comprising launching each desired satellite with the orbital parameters programmed therein.

4. The method as recited in claim 1 wherein generating the command signals includes transmitting the command signals to each desired satellite.

5. The method as recited in claim 1 wherein determining the orbit period includes determining if the trajectory of each desired satellite is equatorial.

6. The method as recited in claim 5 wherein determining the orbit period includes determining the orbit period according to the following if the trajectory is equatorial:

$$P = [m_S D_S D_N / (nD_N + m_s D_s)],$$

where,

P is the orbit period with its sign indicating whether it is a direct or retrograde orbit:

n is an integer with its absolute value equal to the number of times that the satellite transverses the same geographic longitude within the repeating period;

m_s is the number of mean solar day per repeating period and must be a positive integer relatively prime to n;

D_t is the mean solar day, which is 24 hours or 1440 minutes; and

D_N is the nodal day which is the period of the earth-rotation relative to the ascending node or any point of the orbit plane.

7. The method as recited in claim 5 wherein determining the orbit period includes determining the orbit period according to the following if the trajectory is not equatorial:

where,

$$P = \frac{T}{n + m_N}$$

m_N is the number of nodal day per repeating period which must be a positive integer relatively prime to n; and

T is the repeating period that the coverage pattern starts to repeat itself.

8. The method as recited in claim 1 wherein determining the time dependent coverage includes performing a simulation.

9. The method as recited in claim 1 wherein the trajectory is defined by a first coordinate system and wherein determining the tilted trajectory comprises:

translating the first coordinate system into rotation matrices;

transforming the rotation matrices based on the tilting; and

determining a second coordinate system based on the transformed rotation matrices.

10. A system for maximizing satellite constellation coverage at predetermined local peak times for a set of predetermined geographical locations, the satellite constellation having a first coverage and including at least two desired satellites wherein each of the desired satellites have a trajectory associated therewith and a relative orbit within the satellite constellation, the system comprising:

a processor operative to determine a period of orbit for each of the desired satellites to determine a time dependent coverage of the satellite constellation based on the orbit period and the trajectory of each of the desired satellites, to determine a second coverage based on the time dependent coverage which provides maximum coverage by the satellite constellation at the predetermined local peak times and the predetermined geographic locations, and to tilt the trajectory of each of the desired satellites within the satellite constellation to obtain the second coverage; and

means for generating command signals for modifying the trajectory of each of the desired satellite based on the tilted trajectory.

11. The system as recited in claim 10 wherein the means for generating is a computer programmed to launch each desired satellite into space with the modified trajectory.

12. The system as recited in claim 11 wherein the trajectory is a theoretical trajectory.

13. The system as recited in claim 10 wherein the means for generating is a satellite ground station operative to transmit and receive signals to and from each desired satellite.

14. The system as recited in claim 13 wherein the trajectory is an actual trajectory.

15. The system as recited in claim 10 wherein the processor, in determining the orbit period, is further provided for determining if the trajectory of each desired satellite is equatorial.

16. The system as recited in claim 15 wherein the processor, in determining the orbit period, is further operative to determine the orbit period according to the following if the trajectory is equatorial:

$$P = [m_s D_S D_N/(nD_N + m_s D_s)],$$

where,

P is the orbit period with its sign indicating whether it is a direct or retrograde orbit;

n is an integer with its absolute value equal to the number of times that the satellite transverses the same geographic longitude within the repeating period;

m_s is the number of mean solar day per repeating period and must be a positive integer relatively prime to n;

D_s is the mean solar day, which is 24 hours or 1440 minutes; and

D_N is the nodal day which is the period of the earth-rotation relative to the ascending node or any point of the orbit plane.

17. The system as recited in claim 15 wherein the processor, in determining the orbit period, is further operative to determine the orbit period according to the following if the trajectory is not equatorial:

where,

$$P = \frac{T}{n + m_N}$$

m_N is the number of nodal day per repeating period which must be a positive integer relatively prime to n; and

T is the repeating period that the coverage pattern starts to repeat itself.

18. The system as recited in claim 10 wherein the processor, in determining the time dependent coverage, is further operative to perform a simulation.

19. The system as recited in claim 10 wherein the trajectory is defined by a first coordinate system and wherein the processor, in tilting the trajectory, is further operative to translate the first coordinate system into rotation matrices, transform the

rotation matrices based on the tilting, and determine a second coordinate system based on the transformed rotation matrices.

20. A method for providing varying satellite constellation coverage at a plurality of geographic locations while maximizing the resources of the satellite constellation at all times, comprising:

providing a satellite constellation including a plurality of satellites each having a trajectory associated therewith and a relative orbit with said satellite constellation, said satellite constellation having a first coverage area;

selecting a first geographic location having a predetermined local peak time;

tilting each of said plurality of satellites to reorient said satellite constellation without changing the relative orbit of said plurality of satellites with respect to each other within said satellite constellation in order to obtain a second coverage area, which maximizes coverage at said first geographic location during said predetermined local peak time.

21. The method of claim 20, further comprising:

selecting a second geographic location having a second predetermined local peak time that is different from said first geographic location predetermined local peak time; and

tilting each of said plurality of satellites to reorient said satellite constellation without changing the relative orbit of said plurality of satellites with respect to each other within said satellite constellation in order to obtain a third coverage area, which maximizes coverage at said second geographic locating during said second predetermined local peak time.